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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/787,120	02/27/2004	Koichiro Tanaka	0756-7259	4693
31780	7590	09/25/2006	EXAMINER	
ERIC ROBINSON			LUU, CHUONG A	
PMB 955			ART UNIT	PAPER NUMBER
21010 SOUTHBANK ST.			2818	
POTOMAC FALLS, VA 20165				

DATE MAILED: 09/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/787,120

Applicant(s)

TANAKA ET AL.

Examiner

Chuong A. Luu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 9/11/2006.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 7,8,10-13 and 15-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7,8,10-13 and 15-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***REQUEST FOR CONTINUED EXAMINATION (RCE)***

The request filed on September 11, 2006 for a Request For Continued Examination (RCE) under 37 CFR 1.53(d) based on parent Application No. 10/787,120 is acceptable and a RCE has been established. An action on the RCE follows.

## **PRIOR ART REJECTIONS**

### **Statutory Basis**

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

### **The Rejections**

Claims 7-8, 10, 12-13, 15 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (U.S. 7,026,227) in view of Inui et al. (U.S. 2006/0019474).

(7); (8) shaping a first laser beam having a wavelength not longer than that of visible light into an elongated beam on a surface to be irradiated, wherein said laser beam is a of a solid laser;

irradiating the surface with the elongated beam wherein an irradiation area of the

elongated beam has at least a first portion and a second portion;

irradiating the surface with a second laser beam concurrently with the elongated beam, said second laser beam having a fundamental wave emitted from a solid laser, in such a manner that an irradiation area of the second laser beam overlaps at least the first portion of the irradiation area of the elongated beam while moving the surface relatively to the elongated beam and the second laser beam in a first direction (see column 5, lines 7-43);

**(10); (15); (20)** wherein each of the first laser beam and the second laser beam is emitted from one selected from the group consisting of a YAG laser, a YVO<sub>4</sub> laser, a YLF laser, a YAlO<sub>3</sub> laser, an alexandrite laser and a Ti: Sapphire laser (see column 5, lines 40-45);

**(12); (13)** forming a non-single crystalline semiconductor film over a substrate; shaping a first laser beam emitted from a first laser oscillator into an elongated beam on a surface to be irradiated wherein the first laser beam has a wavelength not longer than that of visible light, wherein said laser beam is a of a solid laser;

irradiating the non-single crystalline semiconductor film with the elongated beam wherein an irradiation area of the elongated beam has at least a first portion and a second portion, said first portion having a lower energy density than the second portion, wherein a portion of the non-single crystalline semiconductor film irradiated with the first laser beam is melted;

irradiating at least said portion of the non-single crystalline semiconductor film with a second laser beam emitted from a second laser oscillator, said second laser

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beam having a fundamental wave emitted from a solid laser, wherein the irradiation of said portion of the non-single crystalline semiconductor film with the second laser beam is performed when said portion is in a molten state due to the irradiation of said first laser beam, and an irradiation area of the second laser beam overlaps at least the first portion of the irradiation area of the elongated beam;

moving the substrate relatively to the elongated beam and the second laser beam in a first direction, thereby, forming a crystal grain region in the non-single crystalline semiconductor film;

moving the substrate in a second direction relatively to the elongated beam and the second laser beam (see column 5, lines 40-45).

Tanaka teaches everything above except for harmonic wave laser; said first portion having a lower energy density than the second portion. However, Inui discloses a semiconductor thin film with **(7); (8); (12); (13)**.... harmonic wave laser; said first portion having a lower energy density than the second portion (see paragraphs [0086]-[0089]). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teaching of Tanaka (accordance with the teaching of Inui) to manufacture a semiconductor thin film. Doing so would facilitate the manufacture of the semiconductor device and improve the crystallization structure of the semiconductor device.

## **PRIOR ART REJECTIONS**

### **Statutory Basis**

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

### **The Rejections**

Claims 11, 16-17 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (U.S. 7,026,227) in view of Inui et al. (U.S. 2006/0019474) and further in view of Sato et al. (U.S. 5,304,357).

Tanaka and Inui teach everything above except for a film formed over a substrate transparent to the first laser beam having a thickness  $d$ , and wherein an incidence angle  $\theta$  of the first laser beam to the surface to be irradiated satisfies an inequality  $\theta \geq \arctan(W/2d)$ , when a major axis of the elongated beam or a minor axis of the elongated beam is assumed to have a length of  $W$ . However, Sato discloses an apparatus for zone melting a thin semiconductor film with (11); (17); (21) wherein the surface to be irradiated is a film formed over a substrate transparent to the first laser beam having a thickness  $d$ , and wherein an incidence angle  $\theta$  of the first laser beam to the surface to be irradiated satisfies an inequality  $\theta \geq \arctan(W/2d)$ , when a major axis of the elongated beam or a minor axis of the elongated beam is assumed to have a length of

W (see Figures 17 and 20); **(16)** wherein the first direction and the second direction are orthogonal to each other (see Figures 17 & 20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Tetsuya and Sato. Even through, Tetsuya and Sato do not explicitly describe the depth of the ions implanting into the substrate. However, the depth of the ions implanting into the substrate is considered to be obvious. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Tanaka and Inui (accordance with the teaching of Sato) since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, and it also has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art and it is noted that the applicant does not disclose criticality in the ranges claimed. In re Leshin, 125 USPQ 416 and In re Aller, 105 USPQ 233 (see MPEP 2144.05). Doing so would facilitate the manufacture of the semiconductor device and improve the continuous uniformity of crystallization structure of the semiconductor device.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A. Luu whose telephone number is (571) 272-1902. The examiner can normally be reached on M-F (6:15-2:45).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Chuong Anh Luu', with a stylized, cursive script.

Chuong Anh Luu  
Patent Examiner  
September 15, 2006